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(54) **FIXING DEVICE AND IMAGE FORMING APPARATUS WITH HEATED FIXING DEVICE EXIT ROLLERS**

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G03G 15/20 (2006.01)

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CPC ***G03G 15/6573*** (2013.01); ***G03G 15/2085*** (2013.01); ***G03G 15/2028*** (2013.01)

(58) **Field of Classification Search**
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USPC 399/322, 405, 406
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,898,388 B2 5/2005 Uehara et al.
7,176,952 B2 * 2/2007 Ishida et al.
2003/0063937 A1 * 4/2003 Nomura 399/405
2004/0057741 A1 3/2004 Uehara et al.
2005/0069340 A1 * 3/2005 Noda et al.
2011/0064502 A1 * 3/2011 Hase et al. 399/406

FOREIGN PATENT DOCUMENTS

JP A-04-299369 10/1992
JP 2002162851 A * 6/2002 ..... G03G 15/20
JP A-2002-365967 12/2002
JP A-2004-139040 5/2004
JP 2006-078745 A 3/2006
JP 2008151925 A * 7/2008
JP A-2008-151925 7/2008

OTHER PUBLICATIONS

Dec. 2, 2014 Office Action issued in Japanese Application No. 2011-072224.

* cited by examiner

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(57) **ABSTRACT**

Provided is a fixing device that includes a first rotating member that rotates while pinching a sheet which holds an image on a first surface of the sheet and is transported, fixes the image to the sheet, and heats the image while coming into contact with the first surface. Further provided is a second rotating member that comes into contact with a second surface that is a back surface of the first surface, a third rotating member that guides the sheet by rotating while coming into contact with the first surface of the sheet fed from a gap between the first and second rotating members, and a support member that supports the first, second, and third rotating members with a space through which the heat of the first rotating member is transferred to the third rotating member interposed between the first and third rotating members.

6 Claims, 7 Drawing Sheets

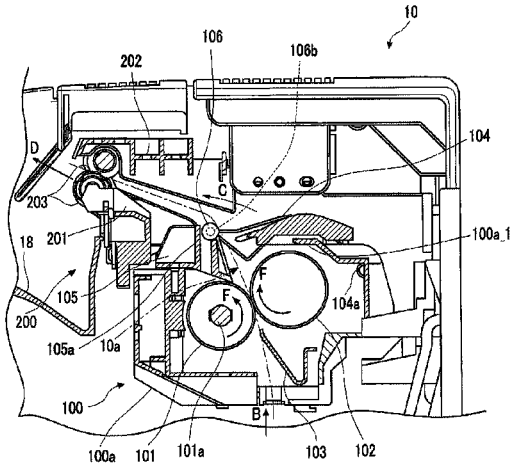


FIG. 1

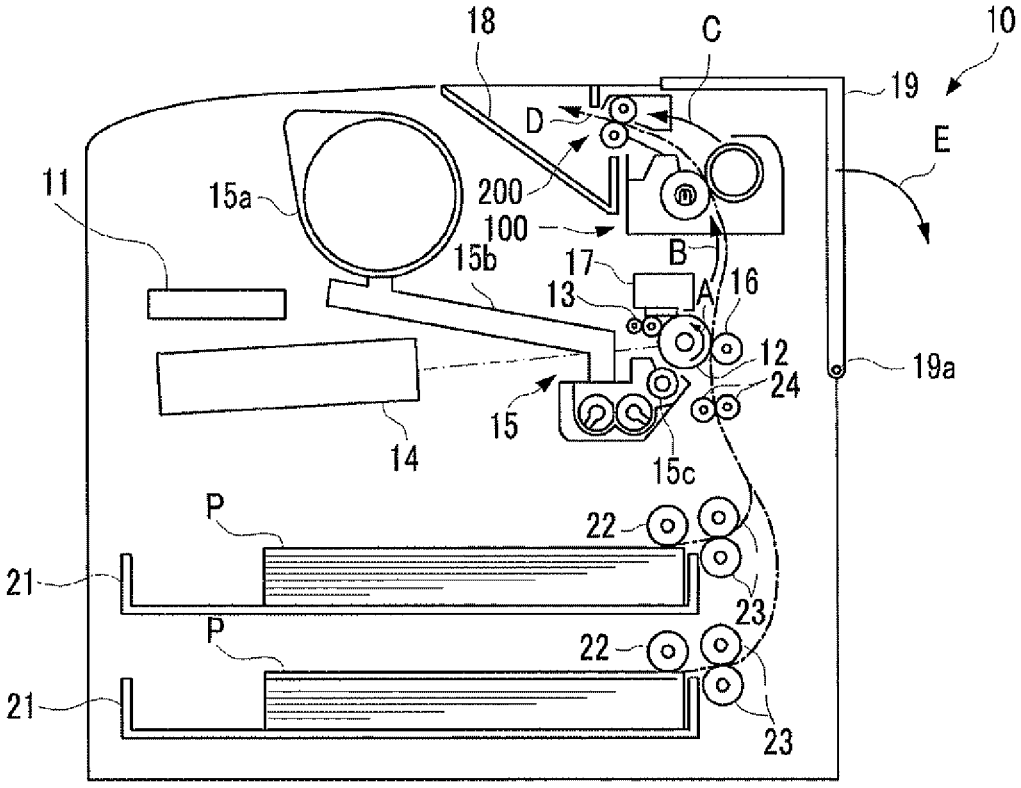
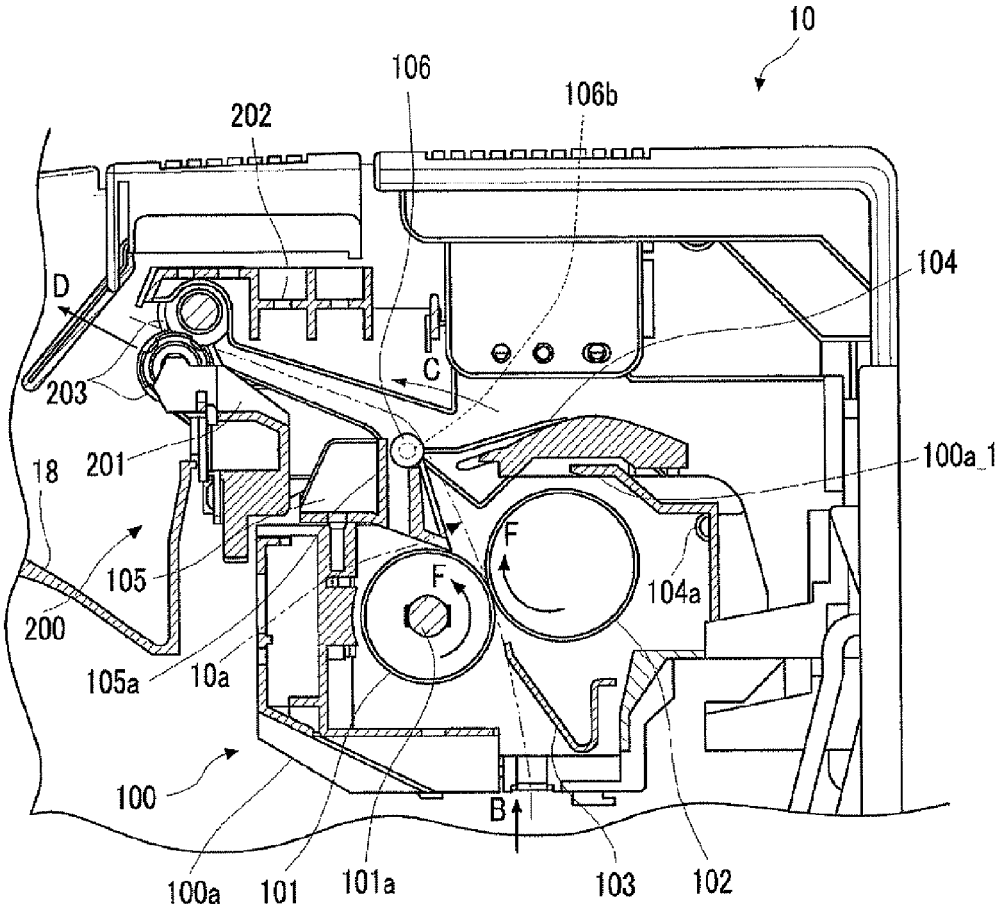

18
C
10
19
D
E
11
15a
200
100
15b
17
B
A
16
13
12
19a
24
15
14
15c
P
22
21
23
P
22
21
23

FIG. 2


10
106
106b
202
104
D
C
203
201
18
100a_1
F
F
105
104a
200
105a
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100
B
100a
101
101a
103
102

FIG. 3

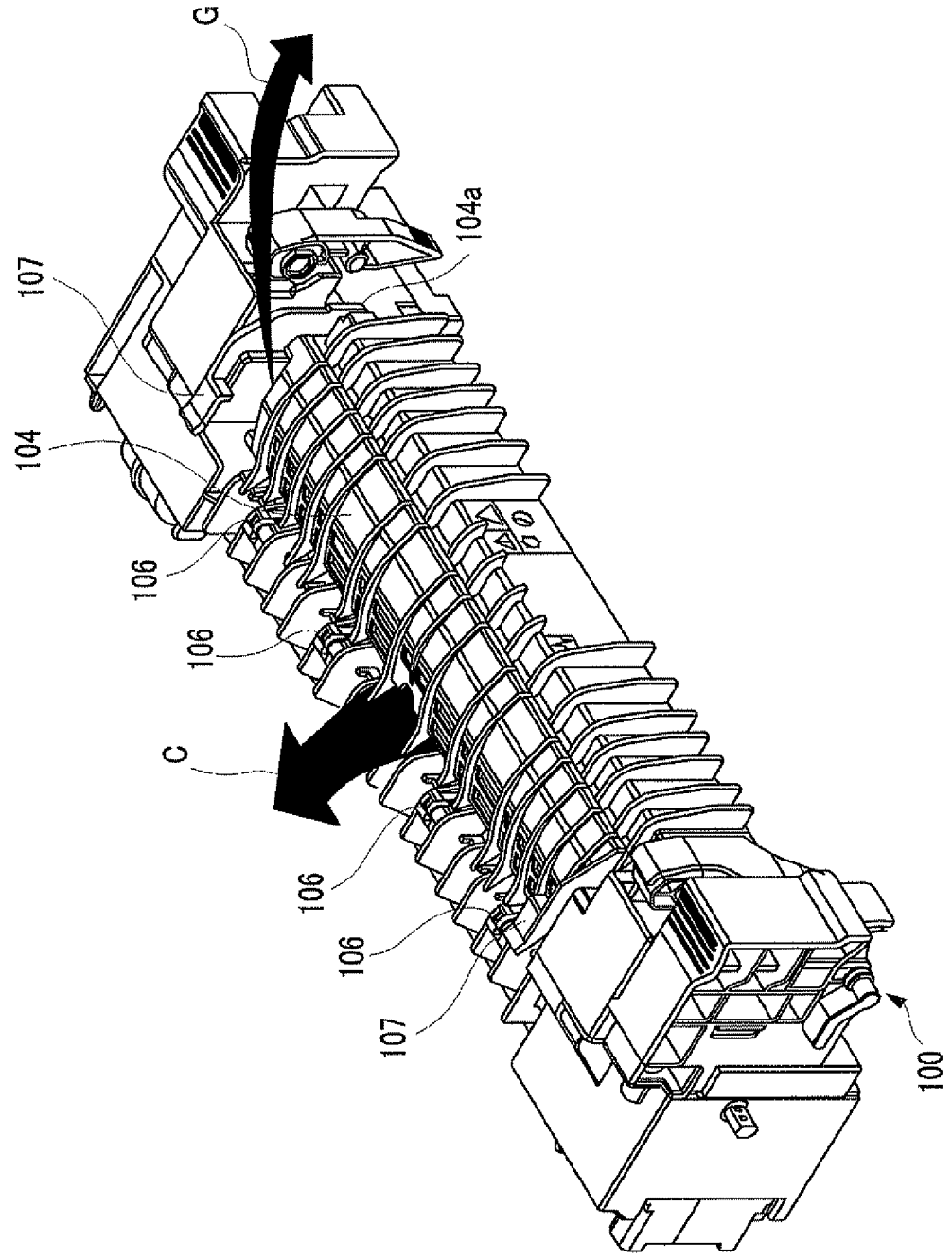


FIG. 4

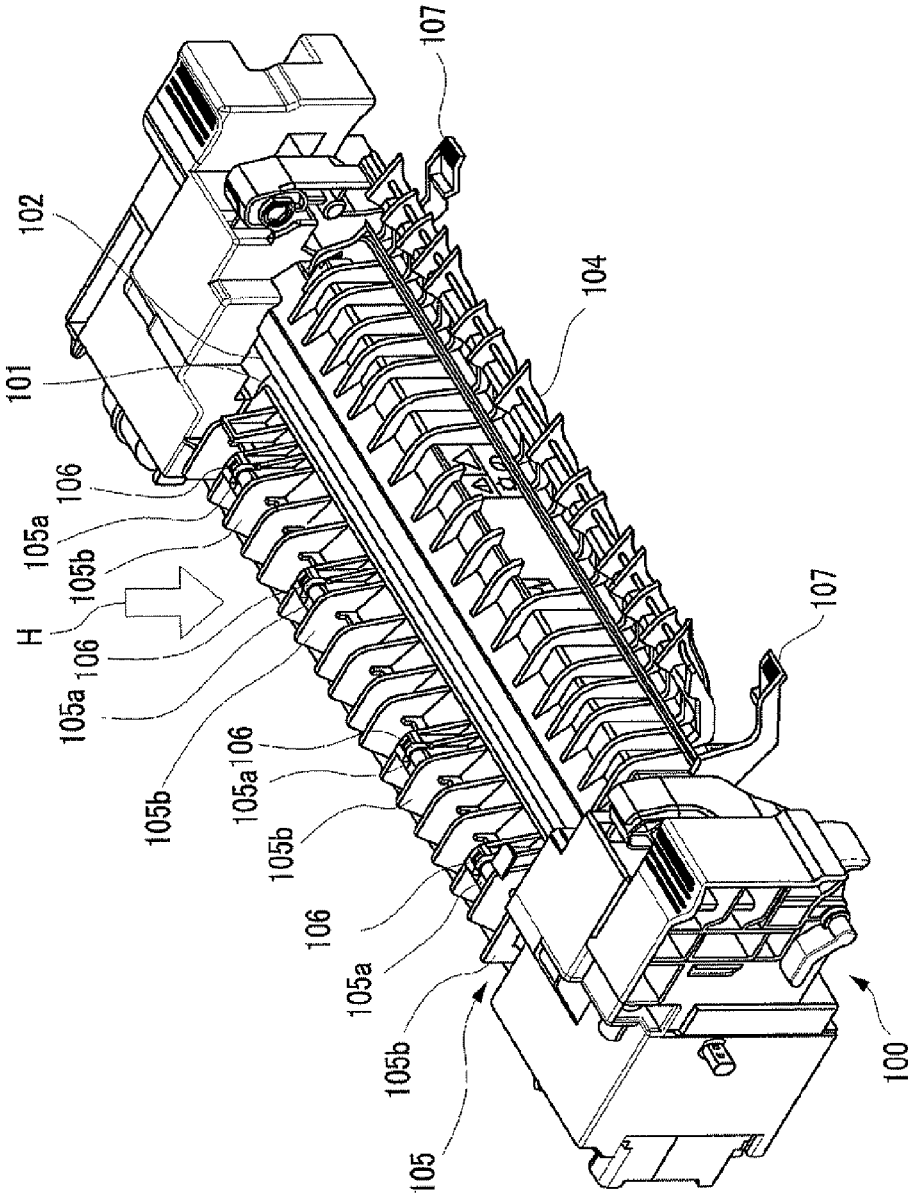
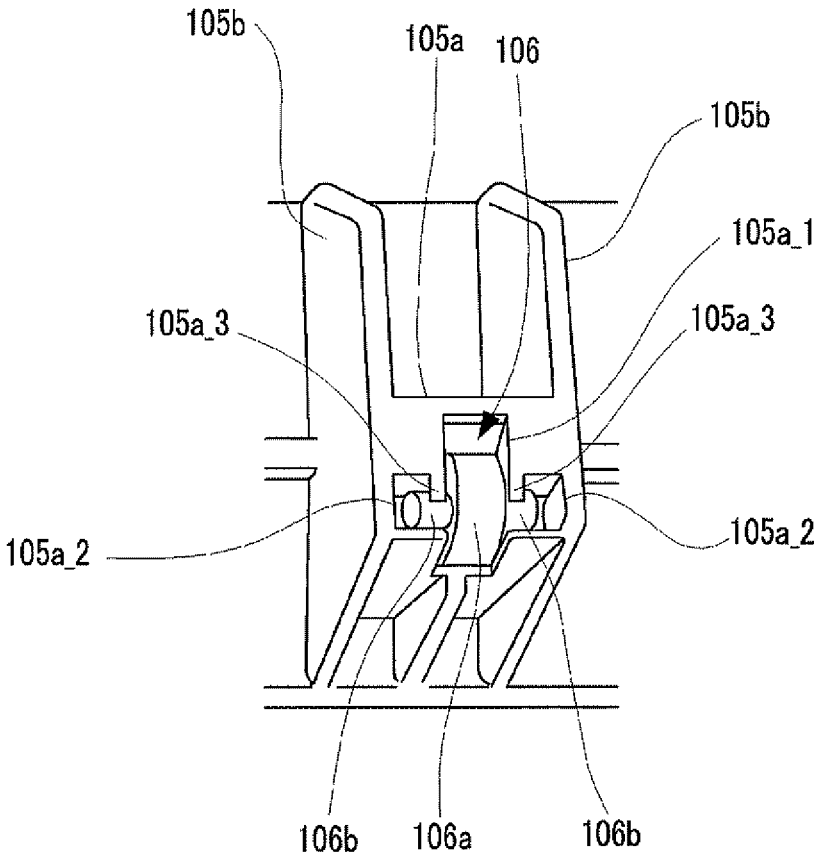

107
102
104
101
106
105a
105b
H
106
105a
105b
106
105a
105b
106
105a
105b
105
100
107

FIG. 5


105b
105a
106
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105a_3
105a_3
105a_2
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106b
106a
106b

FIG. 6A

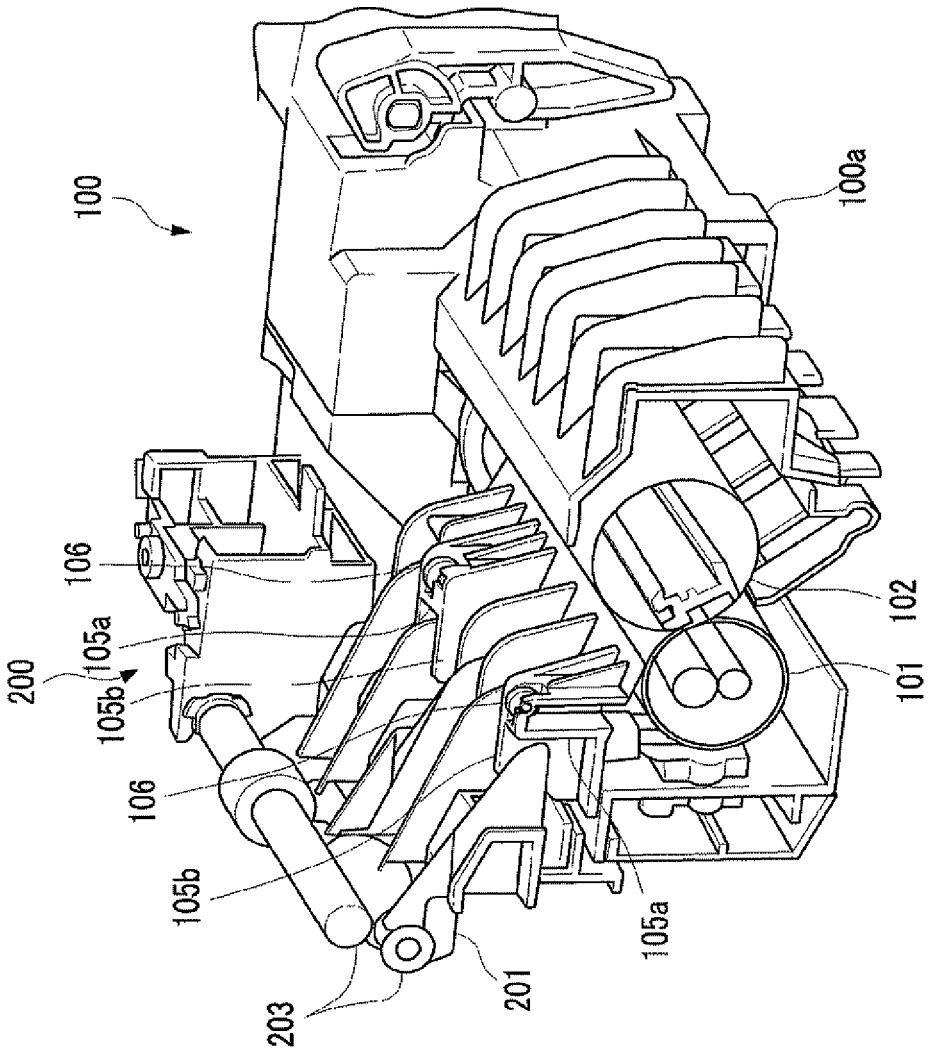
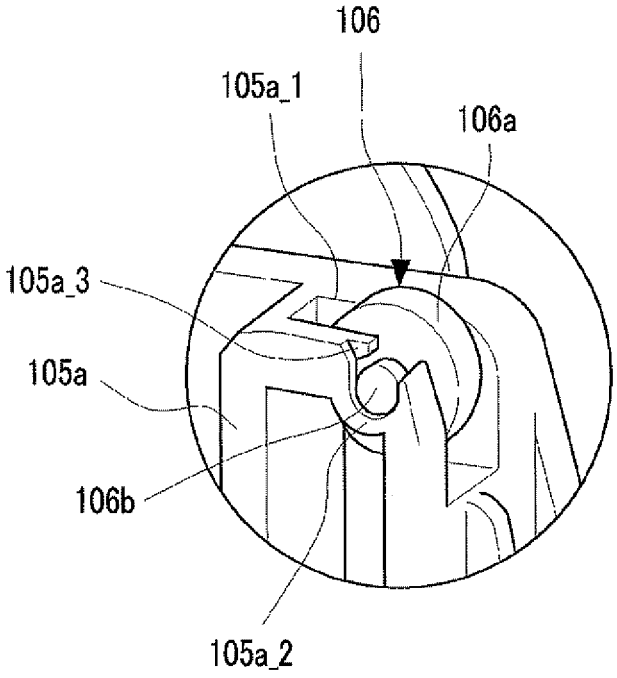


FIG. 6B



FIXING DEVICE AND IMAGE FORMING APPARATUS WITH HEATED FIXING DEVICE EXIT ROLLERS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2011-072224 filed Mar. 29, 2011.

BACKGROUND

(i) Technical Field

The present invention relates to a fixing device and an image forming apparatus.

(ii) Related Art

The following devices are known as a fixing device that fixes an image to a sheet by heating the sheet on which the image has been formed.

SUMMARY

According to an aspect of the invention, there is provided a fixing device that includes a first rotating member that rotates while pinching a sheet which holds an image on a first surface of the sheet and is transported, fixes the image to the sheet, and heats the image while coming into contact with the first surface; a second rotating member that comes into contact with a second surface that is a back surface of the first surface; a third rotating member that guides the sheet by rotating while coming into contact with the first surface of the sheet fed from a gap between the first and second rotating members; and a support member that supports the first, second, and third rotating members with a space through which the heat of the first rotating member is transferred to the third rotating member interposed between the first and third rotating members.

BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention will be described in detail based on the following figures, wherein:

FIG. **1** is a schematic configurational diagram of a printer as an image forming apparatus according to an exemplary embodiment of the invention;

FIG. **2** is a view showing the cross-section of a fixing unit and a discharger of the printer shown in FIG. **1**;

FIG. **3** is a perspective view of the appearance of the fixing unit of which the cross-section is shown in FIG. **2**, when seen from the upper side of a cover;

FIG. **4** is a perspective view of the appearance of the fixing unit of which a cover is opened, when seen from the same direction as the direction in FIG. **3**;

FIG. **5** is an enlarged view of the upper portion of a duct where one roller is supported, when seen from the direction of an arrow H shown in FIG. **4**; and

FIGS. **6**A and **6**B are perspective views of the fixing unit, which is cut at a cutting plane passing across a rotating shaft of a roller, when the cross-section is seen toward the near side.

DETAILED DESCRIPTION

An exemplary embodiment of the invention will be described below.

FIG. **1** is a schematic configurational diagram of a printer as an image forming apparatus according to an exemplary embodiment of the invention.

A fixing device according to an exemplary embodiment of the invention is assembled in the printer shown in FIG. **1**.

An image signal, which is generated outside a printer **10** and represents an image, is input to the printer **10** through a signal cable (not shown) or the like. The printer **10** is provided with a controller **11** that controls the movement of each component of the printer **10**, and an image signal is input to the controller **11**. Further, the formation of an image based on the image signal is performed under the control of the controller **11** in the printer **10**.

Two sheet trays **21** are housed in the lower portion of the printer **10**. Sheets P, which have different dimensions corresponding to the respective sheet trays **21**, are stored in these sheet trays **21** while being stacked. Each of the sheet trays **21** is adapted so as to be capable of being freely drawn for the purpose of the replenishment of sheets P.

Sheets P, which have dimensions corresponding to the dimensions of the image represented by the image signal input to the controller **11**, are fed from one sheet tray of these two sheet trays **21** by a pickup roll **22**. The fed sheets P are separated one by one by retard rolls **23**, and the separated one sheet P is transported upward, and the leading edge of the sheet P reaches standby rolls **24**. The standby rolls **24** function to adjust the transport timing after themselves and to feed a sheet P. The transport timing of the sheet P, which reaches the standby rolls **24**, after the standby rolls is adjusted by the standby rolls **24**, and the sheet P is further transported.

The printer **10** includes a photoreceptor **12** that is provided above the standby rolls **24** and rotates in a direction indicated by an arrow A. Further, a charger **13**, an exposure unit **14**, a developer unit **15**, a transfer unit **16**, and a cleaner **17** are disposed around the photoreceptor **12**.

The photoreceptor **12** has a cylindrical shape, retains electrical charges by charging, and discharges the electrical charges by exposure, so that an electrostatic latent image is formed on the surface of the photoreceptor **12**.

The charger **13** charges the surface of the photoreceptor **12** to a certain charged potential.

Further, an image signal is input to the exposure unit **14** from the controller **11**. Furthermore, exposure light, which is modulated in accordance with the image signal, is output from the exposure unit **14**. The photoreceptor **12** is subjected to the exposure performed by the exposure light, so that an electrostatic latent image is formed on the surface of the photoreceptor **12**.

In addition, after the photoreceptor **12** is subjected to exposure by exposure light and an electrostatic latent image is formed on the surface of the photoreceptor **12**, the electrostatic latent image is developed by the developer unit **15**. The developer unit **15** includes a toner storage section **15***a*, a toner supply passage **15***b*, and a developing roller **15***c*. In the developer unit **15**, toner stored in the toner storage section **15***a* is fed to the vicinity of the developing roller **15***c* through the toner supply passage **15***b*. Further, toner is supplied to the photoreceptor **12** by the developing roller **15***c* and development is performed, so that a toner image is formed on the surface of the photoreceptor **12**.

Here, the standby rolls **24** feed a sheet P so that the sheet P reaches a position facing the transfer unit **16** at the timing where the toner image formed on the photoreceptor **12** reaches a position facing the transfer unit **16**. Further, the toner image formed on the photoreceptor **12** is subjected to the operation of the transfer unit **16** and transferred to the fed sheet P.

A section, which includes the photoreceptor **12**, the charger **13**, the exposure unit **14**, the developer unit **15**, and

the transfer unit **16**, corresponds to an example of an image forming section of the invention.

The toner, which remains on the photoreceptor **12** after the transfer of the toner image, is removed from the photoreceptor **12** by the cleaner **17**.

The sheet P to which the toner image has been transferred further advances in the direction of an arrow B and is heated and pressed by a fixing unit **100**, so that an image formed of a fixed toner image is formed on the sheet P.

The sheet P, which has passed through the fixing unit **100**, advances toward a discharger **200** in the direction of an arrow C, is further fed in the direction of an arrow D by the discharger **200**, and is discharged onto a sheet discharge table **18**.

Moreover, in the printer **10**, a rear panel **19**, which covers the fixing unit **100** and the discharger **200**, rotates about a fulcrum **19***a* in the direction of an arrow E so as to be opened.

In this exemplary embodiment, each of the fixing unit **100** and the discharger **200** is unitized. Accordingly, each of the fixing unit **100** and the discharger **200** is attached to or detached from the printer **10** through an opening portion that appears when the rear panel **19** is opened. For example, when the fixing unit **100** or the discharger **200** deteriorates, it can be replaced with a new one. The fixing unit **100** corresponds to an example of a fixing device of the invention. Further, the fixing unit **100** also corresponds to an example of a fixing section of an image forming apparatus of the invention.

Furthermore, when a sheet P is jammed between the fixing unit **100** and the discharger **200**, the rear panel **19** is opened and the jammed sheet P is removed by a user.

FIG. **2** is a view showing the cross-section of the fixing unit and the discharger of the printer shown in FIG. **1**.

The fixing unit **100** includes a heating roll **101** and a pressure roll **102**. The heating roll **101** has a cylindrical shape and includes a heat source **101***a* therein. The peripheral surface of the pressure roll **102**, which also has a cylindrical shape, is pressed against the peripheral surface of the heating roll **101**. The sheet, which advances in the direction of the arrow B and reaches the fixing unit **100**, is guided to a contact portion between the pressure roll **102** and the heating roll **101** by the sheet guide **103**. The sheet is pinched between heating roll **101** and the pressure roll **102** at the contact portion. At this time, while the surface of the sheet on which the toner image has been formed faces the heating roll **101**, the sheet is pinched between the heating roll **101** and the pressure roll **102**.

The heating roll **101** and the pressure roll **102** rotate in the direction of an arrow F while coming into contact with each other. For this reason, the sheet guided to the contact portion is pinched between the heating roll **101** and the pressure roll **102** at the contact portion, and advances toward the discharger **200**. Further, at that time, the sheet is heated by the heating roll **101** and pressed by the pressure roll **102**, so that an image formed of a fixed toner image is formed on the sheet.

The heating roll **101** corresponds to an example of a first rotating member of the invention and the pressure roll **102** corresponds to an example of a second rotating member of the invention.

The fixing unit **100** includes a frame **100***a* that supports the heating roll **101** and the pressure roll **102** so as to allow the heating roll **101** and the pressure roll **102** to be freely rotatable. Further, in the fixing unit **100**, a cover **104**, which covers the contact portion between the heating roll **101** and the pressure roll **102**, is mounted on the frame **100***a* so as to be freely opened and closed about a fulcrum **104***a* of the frame **100***a*. The cover **104** is closed while a portion of the cover **104** facing the contact portion hits against an extension portion **100***a*_**1** of the frame **100***a* of the fixing unit **100** extending above the pressure roll **102**.

Further, the frame **100***a* of the fixing unit **100** is provided with the following guide frame **105**. The guide frame **105** extends above the heating roll **101** on the downstream side of the contact portion between the heating roll **101** and the pressure roll **102** in a transporting direction, and functions to guide the sheet having passed through the contact portion to the discharger **200**. The sheet having come out of the contact portion between the heating roll **101** and the pressure roll **102** is guided to the guide frame **105**, pushes up the leading edge of the cover **104**, and advances toward the discharger **200** in the direction of the arrow C.

Here, a transporting path **10***a*, which passes by the fixing unit **100** and the discharger **200**, is bent toward the discharger **200** in the vicinity of the leading edge of the cover **104** as shown by a dashed dotted line in FIG. **2**. Further, rollers **106** are disposed at the bent corner of the transporting path **10***a*.

Each of the rollers **106** includes rotating shafts **106***b* that intersect with the transporting direction of a sheet and extend along the direction along the sheet. Moreover, the rotating shafts **106***b* of the roller **106** are rotatably supported by the guide frame **105** at the bent corner of the transporting path **10***a*. In addition, the rollers **106** are supported by the guide frame **105** so that a part of the peripheral surface of each roller **106** protrudes to the inside of the transporting path **10***a* as compared to the guide frame **105**.

A sheet is transported along the transporting path **10***a* so that the surface of the sheet on which a toner image has been formed faces the rollers **106**. Since a part of the peripheral surface of each roller **106** protrudes to the inside of the transporting path **10***a* as compared to the guide frame **105**, a sheet passing along the transporting path **10***a* comes into contact with the rollers **106**. When a sheet comes into contact with the rollers **106**, the rollers **106** rotate with the movement of the sheet.

If the rollers **106** are not disposed at the bent corner of the transporting path **10***a*, there is a concern that a sheet may come into contact with the corner of the guide frame **105** at the bent corner. The surface of a sheet on which a toner image has been formed faces the guide frame **105**. For this reason, if a sheet comes into contact with the corner of the guide frame **105**, there is a concern that the toner image may be damaged due to the friction between the sheet and the corner of the guide frame **105**.

In this exemplary embodiment, a sheet, which is close to the corner of the guide frame **105** on the transporting path **10***a*, comes into contact with the peripheral surfaces of the rollers **106** as described above. Further, since the rollers **106** with which a sheet comes into contact rotate with the movement of the sheet, there is a low possibility that the toner image may be damaged due to the friction between the sheet and the peripheral surfaces of the rollers **106**. As described above, in this exemplary embodiment, due to the rotation of the rollers **106**, a sheet is smoothly transported at the bent corner of the transporting path **10***a* while suppressing the generation of the damage to a toner image.

The rollers **106** correspond to an example of a third rotating member of the invention.

Here, in this exemplary embodiment, the guide frame **105** includes ducts **105***a* that support the rollers **106** and are opened toward the heating roll **101** above the heating roll **101**. Each of the rollers **106** is supported by the upper portion of the duct **105***a* that is opposite to the heating roll **101**, and each of the rollers **106** is exposed to the internal space of the duct **105***a*.

The heating roll **101** generates heat when a toner image is to be fixed. Further, the heat generated by the heating roll **101** is transferred to the rollers **106** as radiant heat through the internal spaces of the ducts **105***a*, and the rollers **106** are heated by the radiant heat. Furthermore, air around the heating roll **101** is heated by the heat generated by the heating roll **101**. The heated air ascends up to the rollers **106** through the internal spaces of the ducts **105***a* due to the convection. Moreover, the rollers **106** are heated even by this air. As described above, each of the rollers **106** is supported with a space, through which the heat of the heating roll **101** is transferred to the roller **106**, interposed between the heating roll **101** and itself.

The frame **100***a* of the fixing unit **100**, which is provided with the guide frame **105** including the ducts **105***a*, corresponds to an example of a support member of the invention.

Here, a space through which the heat of the heating roll **101** is transferred to each roller **106**, like the internal space of the duct **105***a*, may not be formed between the roller **106** and the heating roll **101**. As described above, the sheet, which is fed from a gap between the heating roll **101** and the pressure roll **102**, comes into contact with the rollers **106**. At this time, the toner image, which is formed on the sheet, still sufficiently retains the heat applied from the heating roll **101**. If the above-mentioned space is not formed between each roller **106** and the heating roll **101**, the temperature of the roller **106** is significantly lower than that of the toner image formed on the sheet. For this reason, when the sheet fed from a gap between the heating roll **101** and the pressure roll **102** comes into contact with the rollers **106**, the heat of the toner image formed on the sheet is absorbed by the rollers **106**. As a result, temperature unevenness occurs between a portion of the toner image where each roller **106** comes into contact with the sheet and a portion of the toner image where each roller **106** does not come into contact with the sheet, and the temperature unevenness causes gloss unevenness on the cooled toner image.

In this exemplary embodiment, the heat of the heating roll **101** is transferred to the rollers **106** through the internal spaces of the ducts **105***a* and the rollers **106** are heated by the transferred heat. For this reason, temperature difference between the roller **106** and the toner image formed on the sheet is suppressed. Furthermore, even though the sheet fed from a gap between the heating roll **101** and the pressure roll **102** comes into contact with the rollers **106**, the absorption of heat from the toner image to the rollers **106** is suppressed. As a result, the occurrence of gloss unevenness on the toner image is suppressed.

The rollers **106** and the ducts **105***a* will be described below again.

The sheet, which has passed through the bent corner where the rollers **106** are disposed, enters the discharger **200**.

The discharger **200** includes a lower frame **201** that functions as a lower guide of the transporting path **10***a* and an upper frame **202** that functions as an upper guide.

Further, sheet discharge rolls **203**, which continue to feed the sheet having entered the discharger **200** on the transporting path **10***a* in the direction of the arrow C and further feed the sheet in the direction of the arrow D, are supported by the lower frame **201**. The sheet is transported along the transporting path **10***a* in the direction of the arrow D by the sheet discharge rolls **203**, and is discharged onto the sheet discharge table **18**.

FIG. **3** is a perspective view of the appearance of the fixing unit of which the cross-section is shown in FIG. **2**, when seen from the upper side of the cover.

The sheet having come out of the fixing unit **100** pushes up the leading edge of the cover **104** on the transporting path **10***a*, advances in the direction of the arrow C, and enters the discharger **200**. As described above, the transporting path **10***a* is bent toward the discharger **200** in the vicinity of the leading edge of the cover **104** and the rollers **106** are disposed at the bent corner of the transporting path **10***a*. In this exemplary embodiment, four rollers **106** are disposed side by side at the bent corner in the width direction of a sheet.

Here, when a sheet P is jammed between the fixing unit **100** and the discharger **200** in the printer **10**, the rear panel **19** is opened by a user as described with reference to FIG. **1**. Further, the user puts a hand into the printer **10** and removes the jammed sheet. The cover **104** of the fixing unit **100** is rotatable about the fulcrum **104***a* as described above. Accordingly, when the sheet is to be removed, the cover **104** is rotated about the fulcrum **104***a* and opened by the user.

As shown in FIG. **3**, operating levers **107**, which are used to open the cover **104** in the direction of an arrow G by a user intending to remove the jammed sheet, are mounted at both end portions of the cover **104** in the fixing unit **100**.

FIG. **4** is a perspective view of the appearance of the fixing unit of which a cover is opened, when seen from the same direction as the direction in FIG. **3**.

When a user operates the operating levers **107** and opens the cover **104**, a portion of the transporting path **10***a* shown in FIG. **2**, which is formed between the discharger **200** and the contact portion between the heating roll **101** and the pressure roll **102**, is exposed to the outside. While exposing the transporting path to the outside in this way, a user removes a jammed sheet.

Here, in FIG. **4**, the cover **104** is opened, so that the structure of the guide frame **105** around the roller **106** is also exposed to the outside.

The guide frame **105** includes plural ribs **105***b* that guides a sheet in the direction of the arrow C of FIG. **3** and has the shape of a trapezoidal plate. Further, four ducts **105***a*, each of which supports one roller **106** and is opened toward the heating roll **101** as shown in FIG. **2**, are formed at the guide frame **105**. Each of the ducts **105** is interposed between two ribs **105***b*. Each roller **106** is supported by the upper portion of each duct **105***a*.

The four rollers **106** of this exemplary embodiment correspond to an example of plural rolls of the invention, and the ducts **105***a* formed at four positions correspond to an example of plural pipelines of the invention.

In this exemplary embodiment, the respective four rollers **106** come into contact with a sheet, rotate, and guide the sheet to the downstream side. The rotating members, which guide a sheet, are not limited to these four rollers **106**. For example, one roll body, which extends in the width direction of a sheet, or the like, may also be considered as the rotating members. Since the contact area between a sheet and the four rollers **106** of this exemplary embodiment is smaller than that between a sheet and this one roll body, the four rollers **106** can further suppress the occurrence of gloss unevenness.

Further, the spaces between the heating roll **101** and the four rollers **106** are not limited to the internal spaces of the respective ducts **105***a* that are formed for the respective rollers **106**, and one space, which extends between the four rollers **106** and the heating roll **101**, or the like may also be considered as the spaces. When heat is transferred to the four rollers **106** through the above-mentioned one space, for example, there is a possibility that air heated by the heat of the heating roll **101** may not necessarily be directed to the rollers **106** and is diffused to the periphery. In this exemplary embodiment, air entering the internal spaces of the ducts **105***a*

ascends up to the rollers **106** in the internal spaces without being diffused. As a result, in this exemplary embodiment where heat is transferred to the respective rollers **106** through the internal spaces of the ducts **105***a*, the rollers **106** are more reliably heated by the convection of the heated air as compared to a case where heat is transferred to the respective rollers **106** through the above-mentioned one space.

FIG. **5** is an enlarged view of the upper portion of the duct where one roller is supported, when seen from the direction of an arrow H shown in FIG. **4**.

FIGS. **6**A and **6**B are perspective views of the fixing unit, which is cut at a cutting plane passing across a rotating shaft of a roller, when the cross-section is seen toward the near side. Meanwhile, for ease of understanding, the cover **104** is removed from the fixing unit **100** in FIGS. **6**A and **6**B. Accordingly, the contact portion between the heating roll **101** and the pressure roll **102** is exposed to the outside.

The fixing unit **100**, the lower frame **201** of the discharger **200**, and the sheet discharge rolls **203** are shown in FIG. **6**A. Further, an enlarged view of the structure around the roller **106** on the cross-section is shown in FIG. **6**B.

The rollers **106** and the ducts **105***a* will be described below with reference to FIGS. **5**, **6**A and **6**B.

Each of the rollers **106** includes a disc-shaped roller body **106***a*. Further, the rotating shafts **106***b* protrude from the centers of two circular side surfaces of the roller body **106***a*.

The appearance of the duct **105***a* is formed in the shape of a post interposed between two ribs **105***b*. An opening **105***a*_**1** to which the roller body **106***a* of the roller **106** is fitted is formed from the end face of the upper portion of the duct to the corner of the duct close to the contact portion between the heating roll **101** and the pressure roll **102** shown in FIG. **4**. Further, bearings **105***a*_**2**, which support the rotating shafts **106***b* protruding from the respective circular side surfaces of the roller body **106***a*, are formed on both sides of the opening **105***a*_**1**. Furthermore, shaft pressers **105***a*_**3**, which press the rotating shafts **106***b* supported by the respective bearings **105***a*_**2**, are formed at the upper portion of the duct **105***a*.

The duct **105***a* of this exemplary embodiment includes the upward opening **105***a*_**1** facing the roller **106**. As a result, air entering the internal space of the duct **105***a* directly ascends toward the opening **105***a*_**1**. A shape that is bent in the middle and opened sideways may also be considered as the shape of the duct **105***a*. However, air more easily ascends through the internal space in the duct **105***a* that includes the upward opening **105***a*_**1** as described above. Therefore, according to the duct **105***a*, which includes the upward opening **105***a*_**1**, of this exemplary embodiment, the roller **106** is more reliably heated by the convection of the heated air as compared to a duct that is opened sideways.

Meanwhile, in the above-mentioned exemplary embodiment, a method of heating the roller **106** by not only the radiant heat from the heating roll **101** but also air, which is heated by the heating roll **101** and ascends due to convection, has been also actively employed as a method of heating the roller **106**. For this reason, the duct **105***a* of which the lower end is opened toward the heating roll **101** and the upper end is opened upward is used to efficiently guide ascending air to the roller **106**. However, a method of heating the roller **106** may be a method of heating the roller **106** by using radiant heat from the heating roll **101** as a main heat source without expecting air that ascends due to convection. In this case, a space has only to be formed between the roller **106** and the heating roll **101**, and the space is not limited to the internal space of the above-mentioned duct. Further, a relative positional relationship between the roller **106** and the heating roll **101** is also not necessarily limited to a positional relationship where the heating roll **101** is positioned below the roller **106**. As long as radiant heat from the heating roll **101** is transferred to the roller **106**, the heating roll **101** may be positioned at any position.

Furthermore, the unitized fixing unit **100** has been exemplified above as an example of the fixing device or the fixing section of the invention. However, the fixing device or the fixing section of the exemplary embodiment of the invention is not limited thereto. The fixing device or the fixing section of the invention may be a non-unit type fixing device or fixing section, for example, a heating roll, a pressure roll, or the like may be directly supported by a frame of an image forming apparatus. In this form, the frame of the image forming apparatus corresponds to an example of the support member of the invention.

Moreover, the electrophotographic printer **10** has been exemplified above as the image forming apparatus according to the exemplary embodiment of the invention. However, the image forming apparatus according to the exemplary embodiment of the invention is not limited thereto, and may be, for example, a copying machine, a facsimile, or the like. Further, a fixing unit is not limited to the above-mentioned exemplary embodiment, and the fixing device may be other fixing units such as a flash fixing unit. Furthermore, as long as an image forming apparatus includes a heating fixing device, the image forming apparatus may be another image forming apparatus such as an inkjet type image forming apparatus.

The foregoing description of the exemplary embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

1. A fixing device comprising:

a first rotating member that rotates while pinching a sheet which holds an image on a first surface of the sheet and is transported, fixes the image to the sheet, and heats the image while coming into contact with the first surface;

a second rotating member that comes into contact with a second surface that is a back surface of the first surface;

a third rotating member that guides the sheet by rotating while coming into contact with the first surface of the sheet fed from a gap between the first and second rotating members,

wherein the third rotating member is disposed at a bent corner of a transporting path for transporting the sheet; and

a support member that has a duct that supports the third rotating member with a space through which the heat of the first rotating member is transferred to the third rotating member interposed between the first and third rotating members.

2. The fixing device according to claim **1**,

wherein the third rotating member includes a plurality of rolls that are rotationally driven while coming into contact with the sheet and are disposed at intervals in the width direction of the sheet, and

the support member includes a plurality of pipelines which form mutually separated spaces between the first rotat-

ing member and the plurality of rolls and through which heat is transferred to the plurality of rolls, respectively.

3. The fixing device according to claim **2**,

wherein the plurality of pipelines include upward openings that face the rolls, respectively.

4. An image forming apparatus comprising:

an image forming section that forms an image on a first surface of a sheet and feeds the sheet to the downstream side; and

a fixing section that receives the sheet and fixes the image to the sheet, the sheet holding the image, which is formed by the image forming section, on the first surface,

wherein the fixing section includes

a first rotating member that rotates while pinching the sheet fed from the image forming section, fixes the image formed on the sheet to the sheet, and heats the image while coming into contact with the first surface,

a second rotating member that comes into contact with a second surface that is a back surface of the first surface,

a third rotating member that guides the sheet by rotating while coming into contact with the first surface of the sheet fed from a gap between the first and second rotating members, wherein the third rotating member is disposed at a bent corner of a transporting path for transporting the sheet, and

a support member that has a duct that supports at least the third rotating member with a space through which the heat of the first rotating member is transferred to the third rotating member interposed between the first and third rotating members.

5. The image forming apparatus according to claim **4**,

wherein the third rotating member includes a plurality of rolls that are rotationally driven while coming into contact with the sheet and are disposed at intervals in the width direction of the sheet, and

the support member includes a plurality of pipelines which form mutually separated spaces between the first rotating member and the plurality of rolls and through which heat is transferred to the plurality of rolls, respectively.

6. The image forming apparatus according to claim **5**,

wherein the plurality of pipelines include upward openings that face the rolls, respectively.

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